Exhibit 1

PATENT APPLICATION
DOCKET NO. 200300109-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Mardilovich, Peter Herman, Gregory Punsalan, David Berhane, Samson
SERIAL NO.:	10/618,049
FILED:	July 11, 2003
FOR:	ELECTROLESS DEPOSITION METHODS AND SYSTEMS
ART UNIT:	1762
EXAMINER:	Abramowitz, Howard E.
DOCKET NO.:	200300109-1

CERTIFICATE OF DEPOSIT UNDER 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail, postage prepaid, under 37 C.F.R. § 1.8 on the date indicated below and is addressed to Assistant Commissioner for Patents, Washington, D.C. 20231.

Brenda Wiseman
Name

6/19/06
Date of Deposit

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80528-9599

DECLARATION OF PETER MARDILOVICH, GREGORY HERMAN, DAVID PUNSALAN, AND SAMSON BERHANE UNDER 37 C.F.R. § 1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

We, Peter Mardilovich, Gregory Herman, David Punsalan, and Samson Berhane declare as follows:

1. We are the named inventors in the above-captioned application and the subject

matter described and claimed therein.

2. It is my understanding that various claims in the above-recited patent application have been rejected in view of the patent entitled: Depositing Solid Materials, US Patent Application No. 2005/0174407.

3. It is further my understanding that US Patent Application No. 2005/0174407 was filed on December 3, 2002, and published on August 11, 2005.

4. The invention as described and claimed in our currently pending patent application was conceived and reduced to practice prior to December 3, 2002.

5. Exhibit 2 contains a redacted version of an invention disclosure which was prepared and submitted to our employer, Hewlett Packard Company, prior to December 3, 2002 in accordance with our standard practice of disclosing inventions in preparation for filing patent applications.

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6. We each declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful, false statement may jeopardize the validity of the application or any patent issuing thereon.

DATED this 14 day of June, 2006.

Peter Mardilovich, Co-Inventor

Gregory Herman, Co-Inventor

David Punsalan, Co-Inventor

Samson Berhane, Co-Inventor

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DATED this 14th day of June, 2006.

Peter Mardilovich, Co-Inventor

Gregory Herman, Co-Inventor

David Punsalan, Co-Inventor

Samson Berhane, Co-Inventor

Exhibit 2

Invent

Disclosure No. 200300109

Invention Disclosure - DBI Document No. 63WS

PD No.	Date Received	Collection
200300109	[redacted]	IPG

General Information

Title Reactive Inkjet Deposition.

Abstract This invention describes the fabrication of any material which is created by reaction of multiple reactants that are locally deposited by means of inkjet printheads. The primary application is to fabricate metal lines via the electroless plating technique. However the technique may be extended to fabricate patterns of other materials requiring multiple reactants (e.g. polymers made by monomer + initiator) .

Projects Low cost electronics

Products Biological Sensors, Bioterrorism Sensor , Chemical Sensors, Cross-Point Memory, Display, Micro-fluidics, Micro-Inkjet Printing, Organic Displays and Organic Electronics

Attachments

Attachments TIJ_for_electroless_Rev1.ppt - [redacted] - Major steps of inkjet electroless deposition (Uploaded by Peter Mardilovich)

Inventor Information

Inventors	**Peter Mardilovich** [redacted]	Hewlett-Packard Company Americas (6410-3124) [redacted] United States [US]	Corvallis [redacted]
	Gregory Herman [redacted]	Hewlett-Packard Company Americas (6410-3124) [redacted] United States [US]	Corvallis [redacted]
	David Punsalan [redacted]	Hewlett-Packard Company Americas (6410-3124) [redacted] United States [US]	Corvallis [redacted]
	Samson Berhane [redacted]	Hewlett-Packard Company Americas (6410-3123) [redacted] United States [US]	Corvallis [redacted]

United States [US]

Description of Invention

Problems Solved Fabrication of patterned lines (e.g. metal interconnect for electronic devices, patterned photoresist) typically requires either cost intensive equipment, numerous processing steps, and/or high temperature sintering. This disclosure describes a means to fabricate the lines/patterns of material with much fewer processing steps, thus reducing required time, equipment, and costs. For the case of electroless deposition, desirable material properties may be achieved at reduced temperatures*. Reduced processing temperatures enable the use of organic substrates or low temperature melting materials which may be more cost effective.

*As discussed at [redacted] - a major challenge for low cost electronics is the ability to obtain low resistivity (high conductivity) metal lines processed at low temperatures. For example, at processing temperatures of 450°C - the resistance of a "spray deposited" Ag line is still 5 to 10 times larger than that of bulk material. At a processing temperature of 100°C, resistance is 100x of bulk.

Prior Solutions For the case of metal lines, there are a few different techniques:

1. Using photolithography (metal deposition, photoresist deposition, exposure, development, etching of exposed metal regions, photoresist removal).
2. Inkjet printing of colloidal metal particles dispersed in a binder with subsequent annealing/sintering. Relatively high temperature may be required, as a result it is not applicable for many polymer substrates.
3. Inkjet printing of colloidal metal particles dispersed in a binder with subsequent processing with a laser. Localized heating is possible, although laser adds cost and complexity. Still may damage regions of substrate.
4. Thick films can be deposited by syringe technique. The same limitation as #2 - relatively high temperatures are required for the sintering of the deposited film.
5. Catalyst deposition by inkjet and a second step of inserting entire substrate into electroless deposition bath. This process may lead to poor performance from impurities at other regions of the device.
6. Screen printing a conductive paste followed by high temperature sintering.

Description The major steps for metal line fabrication using electroless deposition reactants are:

1. Deposition of the catalyst by inkjet (well known in the art, it is not a part of the disclosure).

2. Deposition (with optional delay) of metal solution from one (set of) nozzle(s) and the reducing agent from another (set of) nozzle(s).

3. Multiple passes may be used to achieve required thickness of the metal layer.

4. Rinsing of the deposited area between passes and a final rinse can be performed by water stream or by inkjet as well (some delay prior to rinsing may be required to allow completion of the reduction reaction).

In general however, the process may be used to fabricate any patterned material which is the product from reactant, A, B (and C..), where A, B and C... are brought into contact by means of inkjet delivery. The computerized/mechanical control of inkjet printing systems may be exploited to implement precise scheduling of the delivery of each of the reactants if such control is required.

Advantages

1. This invention allows a significant decrease in the consumption of chemicals compared to screen printing or spin coating.

2. For the case of electroless metal deposition, it enables deposition of different metals on the pre-seeded catalyst.

3. It is a low temperature process for localized metal deposition. Since it is localized - there is no need for subsequent patterning via photolithography and etch. The low processing temperature allows organic substrates to be used.

4. The reaction products are typically nitrogen, water, and/or carbon dioxide and are removed at low temperatures. The process does not require the removal of binders or suspensions by thermal processing (either locally or the entire substrate). The high temperature reaction of the metal with the atmosphere, binders and/or suspensions may result in metallic films with poor properties due to impurities.

Invention History

Published No

Announced No

Disclosed [redacted]

Next Three Months No

Described No

Built No

Government Contract No

Related Disclosure No

Innovation Workshop No

Witnesses

Witnesses	**Thomas Lindner**	**Hewlett-Packard Company**	**Corvallis**
		[redacted]	[redacted]
	Kurt Ulmer	**Hewlett-Packard Company**	**Corvallis**
		[redacted]	[redacted]

Classification

Recommended Classification IPG: Emerging Technologies: Other Funded Projects

Keywords Electroless Deposition, ink jet processing, inkjet and TIJ

[redacted]

Administrative Record

Date Submitted [redacted]

Legal Clerk [redacted] Hewlett-Packard Company Corvallis

[redacted]

[redacted]

PD Number 200300109

Date Received by Legal [redacted]

Major steps of Inkjet Electroless Deposition

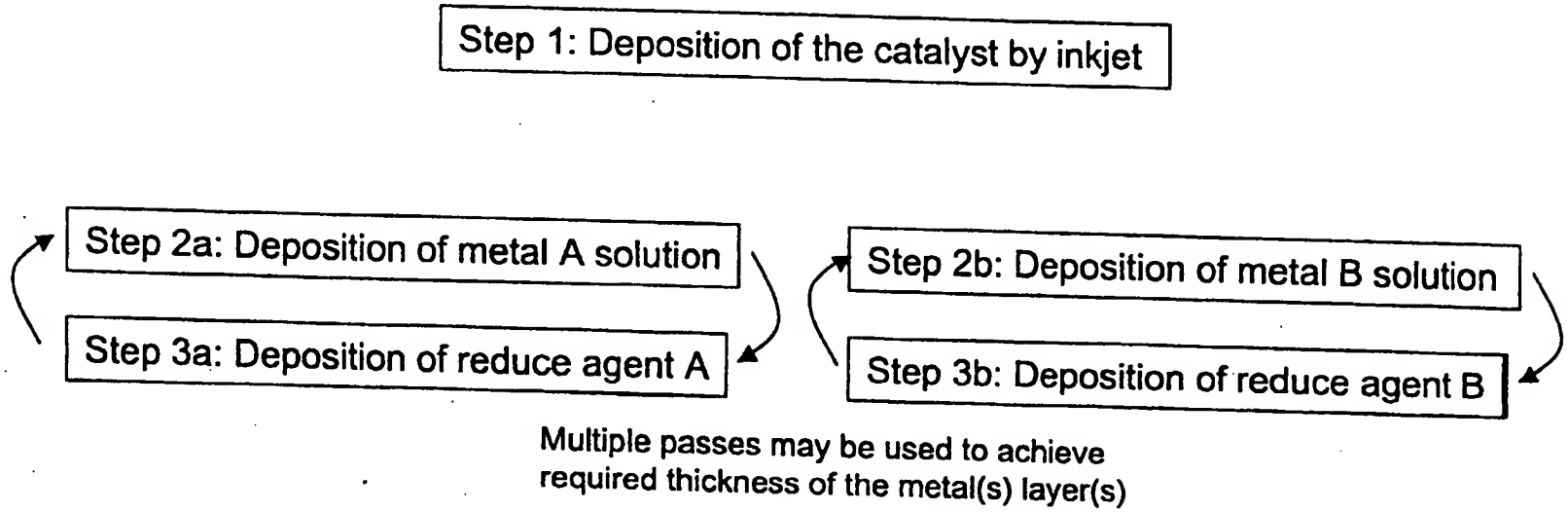

Figure 1.

[redacted]
(PM, GH, DP, SB)

Chemistry of major steps (an example)

Step 1 $SnCl_2 + PdCl_2 \longrightarrow Pd^0 + Sn(OH)_4 + Sn(OH)_{1.5}Cl_{0.5}$ + other Sn hydroxy-chlorides

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Step 2 Solution: $Pd(NH_3)_4Cl_2 + NH_4OH + Na_2EDTA$

Step 3 Solution: diluted H_2NNH_2 or HCOH (Formaldehyde)

Reduction

$$2Pd(NH_3)_4Cl_2 + H_2NNH_2 + 4NH_4OH = 2Pd + N_2 + 8NH_3 + 4NH_4Cl + 4H_2O$$

OR

$$2Pd^{2+} + H_2NNH_2 + 4OH^- = 2\mathbf{Pd^0} + N_2 + 4H_2O$$

Figure 2.

[redacted]
(PM, GH, DP, SB)